4.0 EXISTING CONDITIONS/ ENVIRONMENTAL SETTING

4.1 PROJECT SITE

PREVIOUS USE OF THE SITE

The proposed project site exists within a fuel oil storage tank facility constructed in 1961. This tank facility provided a fuel source for the Southern California Edison (SCE) Huntington Beach Generating Station (now owned by AES Huntington Beach, LLC), which began operating in 1958. By the late 1980s, the SCE Generating Station was utilizing primarily natural gas as a fuel source for electric energy generation. Although fuel oils were no longer necessary for operation of the generating facility, SCE was required to maintain a back-up fuel source, and the storage of fuel oils at the tank facility continued. SCE then received notice from the California Independent Systems Operator (ISO) that back-up fuel supplies were no longer necessary, thus eliminating the need for the storage tanks associated with the generating facility. In May 2001, AES Huntington Beach, LLC, owner of the Huntington Beach Generating Station (HBGS), acquired ownership of the fuel oil storage tank area from SCE, and has entered into an agreement with Poseidon Resources Corporation for the lease of a portion of the property (refer to Section 3.4B, *PROJECT SITE LEASE*). The storage tank area contains a total of six tanks, ranging in capacity from 924,000 gallons to 8.64 million gallons. Implementation of the proposed project would require the demolition of three of the six tanks (three fuel oil tanks). The three fuel oil storage tanks to be demolished have historically been referred to as the South, East, and West fuel oil storage tanks (refer to Exhibit 3-2, *SITE VICINITY MAP* for their precise location). These storage tanks are 40 feet high, cylindrical in shape and are surrounded by 10 to 15-foot high earthen containment berms, pipelines, pumps, and associated structures. On-site vegetation consists mainly of non-native low-lying shrubs and bushes along the eastern border of the project site. The topography of the site is relatively flat, gently sloping to the southwest, with an elevation of approximately five feet above mean sea level (msl) (refer to Exhibit 5.7-1, *DESALINATION FACILITY SITE PHOTOGRAPHS*).

SURROUNDING ADJACENT LAND USES

Surrounding adjacent land uses to the proposed desalination facility include HBGS to the southwest, a wetland area to the southeast, the Huntington Beach channel operated by OCFCD flood channel to the east, a fuel oil storage tank to the north, and an electrical switchyard to the west. Additional surrounding land uses include Pacific Coast Highway to the south; the Pacific Holdings storage tank facility to the east; Ascon/Nesi Landfill to the northeast; commercial, industrial, recreational, and residential uses to the north; and Newland Street, Huntington-By-The-Sea Mobile Home Park, and Cabrillo Mobile Home Park to the west. Uses surrounding the HBGS intake/discharge pipeline connections consist of various generating station uses and parking areas.

LAND USE/PLANNING

The City of Huntington Beach General Plan designates the proposed project site as Public (P). Typical permitted uses within areas of this designation include governmental administrative and related facilities, such as utilities, schools, public parking lots, infrastructure, religious, and similar uses. The project site is zoned as Public-Semipublic with Oil and Coastal Zone Overlays (PS-O-CZ). This zoning district provides for similar uses to those allowed by the City of

Huntington Beach General Plan. The Seawater Desalination Project at Huntington Beach is a permitted use. Refer to Exhibit 3-2, *SITE VICINITY MAP* for additional information.

HUNTINGTON BEACH GENERATING STATION

Background and History

As stated above, the HBGS began operation in 1958 under the ownership of SCE. The power plant utilized fuel oil for production of electricity through its five generating units until the late 1980s, when the generating units were converted for natural gas operation. In 1995, SCE retired two existing generating units (Units 3 and 4) due to limited use.

AES Huntington Beach, LLC, acquired the HBGS from SCE in 1998, and later acquired the fuel oil storage tank property in 2001. In 2001, AES filed an Application for Certification (AFC) with the California Energy Commission (CEC) to rebuild and upgrade ("retool") Units 3 and 4 to meet increasing electrical demand in California. The AFC (which was ultimately approved by the CEC in May 2001) and subsequent retool brought the total electrical generation capacity of HBGS to 1,103 megawatts (MW). Until October 2002, Units 1 through 5 were available for operation at the HBGS. However, as part of a South Coast Air Quality Management District (SCAQMD) order, Unit 5 (a combustion turbine unit) was permanently removed from operation, and all permits for this unit were surrendered. As such, current operation at the HBGS consists of four steam turbine generating units with a total capacity of 880 MW. Conditions applicable to AES by the CEC as part of the AFC include:

- ❖ EMERGENCY-1: In consideration of this expedited certification to the Governor's Executive Order and before commencing commercial operation of the project, AES shall enter into an electricity sales contract with DWR to sell the generation from Huntington Beach Units 3 and 4 to address the electricity supply emergency.

- ❖ EMERGENCY-2: This certification is granted by the Energy Commission for a period of ten (10) years. An interim review shall be conducted as follows. No sooner than January 1, 2006 and no later than April 1, 2006, the project owner shall present evidence to the Commission supporting the following Commission findings:

  - the project owner has substantially complied with the conditions of certification;
  - the project owner has implemented or is implementing to the extent feasible the mitigation measures it is responsible for implementing as a result of studies required by the conditions of certification; and
  - all currently required permits (i.e. NPDES) are in force and the project owner is in substantial compliance with each permit.

  If the Commission determines that it cannot make all the above findings, and if the project owner fails, within a period of 60 days from such determination or such other period as the Commission shall determine to be reasonable under the circumstances, to bring the project into compliance, the Commission may terminate certification or take any other action permitted by law.

- ❖ EMERGENCY-3: On or before June 30, 2004, AES shall submit to the Commission and the City of Huntington Beach a Master Development Plan setting forth its plans for the long-term use of the Huntington Beach Generating Station site beyond September 30, 2006, including but not limited to its plans for the operation, repowering, reconfiguration, closure, decommissioning, moth-balling, demolition, or dismantling of any operating unit then in place.[1]

Regulatory Framework/Compliance

The energy sector of California is regulated by a number of agencies. The CEC is the principal point of oversight as it relates to major power generating facilities. The CEC has the exclusive authority to certify the construction and operation of thermal electric power plants 50 megawatts or larger and all related facilities in California. The CEC's site certification process provides a timely review and analysis of all aspects of a proposed project, including need, public health and environmental impacts, safety, efficiency, and reliability.

Once operating permits are issued for an electric generating facility, the operating permits are managed by responsible agencies, including: the Regional Water Quality Control Board (storm water and wastewater discharges/NPDES) and the regional air quality management district (air emissions). The power plant applicant is responsible for the periodic renewal of these permits with the applicable responsible agency.

The California Public Utility Commission (CPUC) regulates market behavior and pricing for the power sector in California. The Federal Power Commission (FPC) performs a similar function at the federal level. The ISO regulates the operation of the electric transmission grid and directs the dispatch of generating units to serve the system.

HBGS Operations

The existing HBGS consists of four generating units (Units 1-4). Each unit is equipped with two condensers. Units 1 and 2 are rated at 215 net MW and Units 3 and 4 are rated at 225 net MW. HBGS has a total nominal generating capacity of 880MW. The station uses a once-through cooling system with an offshore intake and outfall. The existing HBGS intake/discharge facilities traverse land owned by the California State Lands Commission (CSLC), and the land is leased to AES. Cooling water is supplied to the generating station from the ocean through an intake structure located 1,840 feet offshore (see Exhibit 4-1, *HBGS INTAKE AND OUTFALL LOCATION MAP*). The generating station's offshore seawater intake structure consists of a vertical riser with a horizontal velocity cap supported five feet above the opening to the cooling water conduit. The entire structure rises about 15.8 feet above the ocean floor where the total water depth is approximately 34 feet. Cooling water flow varies between 127 MGD and 507 MGD depending on the number of pumps that are in operation. The intake collects seawater at a mean velocity of 2.0 feet per second and conveys the flow through a 14-foot diameter conduit, with screening, to the HBGS intake structure located on the HBGS property. The HBGS intake structure consists of an open forebay from which the seawater flows through two trash racks, each constructed of vertical steel bars with three-inch openings between the bars. Downstream of the trash racks, the water flows through four vertical traveling screens with 3/8-inch mesh screening. The screened seawater is then conveyed through a 14-foot x 11-foot rectangular conduit into the generating station cooling water pump well structure. The condensers are supplied with cold seawater by eight cooling water pumps (two for each generating unit). Six of the cooling water pumps (Units 1, 2 and 4) are rated at 63.4 MGD (44,000 gallons per minute [gpm]), while the remaining two pumps (Unit 3) are rated at 66.7 MGD (46,300 gpm).

The cooling water pumps convey the screened seawater through thousands of 7/8-inch diameter tubes that make up the generating station's condensers. Steam exiting the facility's

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1 Application for Certification 00-AFC-13, California Energy Commission Decision, May 2001.

turbines, passes over the outer surfaces of the condenser tubes and is condensed back to a liquid state to be pumped back to the boilers.

During this process heat is transferred to the seawater and its temperature is raised, on average, by 18°F (10°C). The maximum temperature increase specified in the facility's NPDES permit is 30°F (16.5°C).

After passing through the condensers, the warmed seawater (cooling water) is returned to the discharge well located at the HBGS intake structure via two 108-inch (nine-foot) diameter discharge pipelines. From the discharge well the cooling water flow is conveyed back to the ocean via a single 1,500-foot long, 14-foot diameter conduit, then through a discharge structure identical to the intake structure except for the absence of a velocity cap. Instead, the discharge vertical riser structure is capped with a 12-inch by 18-inch mesh screen constructed from one-inch by three-inch flat bars.

Design and Operation Criteria of Condenser Cooling Water Systems

Most industrial production processes need cooling water to operate efficiently and safely. Refineries, steel mills, petrochemical manufacturing facilities, electric utilities and paper mills all rely on equipment or processes that require efficient temperature control. Cooling water systems control these temperatures by transferring heat from the hot process fluids into cool water. At generating stations, such as the HBGS, the process fluid to be cooled is steam after it has passed through the steam turbine and generated power. As the cooling occurs, the cooling water itself gets warmer and must be cooled or discharged and replaced by a fresh supply of cooling water. Where the cooling water is used once and then discharged, the system is known as once-through cooling.

Once-through cooling systems characteristically involve large volumes of water and small increases in water temperature. These systems are usually employed when water is readily available in large volume at low cost. Once-through cooling systems for generating stations are typically operated at a high load factor. They are started several hours prior to startup of the balance of the facility, and are operated several hours after facility shutdown in order to fully cool the steam condensing equipment.

Although simple in design and operation, once-through cooling systems are subject to corrosion, scaling and microbial growth and fouling. Microbial growth and fouling result in energy losses due to increased frictional resistance and increased heat transfer resistance, increased capital costs for excess equipment capacity to account for fouling, increased maintenance costs for replacement of equipment with severe under-deposit corrosion, and shutdowns to clean equipment with loss of production. With respect to the HBGS, the most significant problems are debris plugging the condenser tubes, algae growth, and mussel growth and the requirement that all three of these are controlled without removing the units from service.

The cleaning methods for bio-fouled (bio-fouling is the attachment of biological materials such as protozoa, amoeba, fungi, and other organisms to surfaces, forming a "bio-film") systems consist of physical and chemical methods (biocides sanitization). Physical methods are simple but show limited efficacy (flushing) or are effective only for loosely adherent films (backwashing) or for thinner deposits (non abrasive sponge balls). These cleaning methods also require the power generation units to shutdown. The most common approach to bio-fouling problems in cooling water systems is the use of biocides, substances able to drastically reduce the total number of cells in the feedwater and to attack and weaken the stability of the bio-film.

INSERT EXHIBIT 4-1, HBGS INTAKE AND OUTFALL LOCATION MAP

The efficacy of biocides depends on several factors like the kind of biocide and its mechanism of action, its concentration, its kinetics, and the way it is dosed. Research has shown that a continuous bio-fouling monitoring system (on-line and side-stream monitors, visual inspections etc.) and a chlorine dioxide (ClO_2) dosage provides the best results.[2] The HBGS utilizes chlorination, heat treating, and mechanical cleaning to control condenser fouling problems.

There are benefits to continuous operation (as opposed to pumping water only when units are generating electricity) of once-through cooling water systems at facilities such as the HBGS. These include:

- Continuous monitoring and control of steam condenser fouling (bio-film formation);
- Reduction of potential leaching of steam condenser metals (copper) typically caused by shutdowns; and
- Reduction of potential cold shock (loss of thermal plume) to affected aquatic life.

The HBGS is allowed to operate its pumps 24 hours per day, every day under its NPDES discharge permit, issued and monitored by the Santa Ana Regional Water Control Board (SARWQCB).

Alternative Modes of HBGS Operation

Currently, HBGS has three distinctive modes of operation: normal (typical) mode, standby mode, and heat treatment mode.

Normal Mode of HBGS Operation

During normal operation mode the generating station produces electricity. The amount of electricity being generated dictates how many units are running. This in turn dictates the condenser cooling water flow rate. The table below shows the cumulative effect on rated capacity flow rate based on the number of units running and therefore the number of pumps running. The historical maximum cooling water system flow rate at HBGS is 507 MGD.

Table 4-1
RATED CAPACITY FLOW RATE AT HBGS

Generating Units On-Line	1	1,2	1,2,4	1,2,3,4
Number of Pumps On-Line	2	4	6	8
Condenser Cooling Water Pump Rated Capacity (MGD)	127	254	380	514

In normal mode, the generating station's discharge is, on average, about 18°F (10°C) above ambient seawater temperature. As mentioned in HBGS regulatory framework, during the normal mode of operation the maximum discharge temperature specified in the facility's NPDES permit is 30°F (16.5°C).

[2] Once-through cooling systems antifouling treatment by ClO_2 M.Belluati 1, L.Bartole 2, G.Bressan 2, (1: Caffaro, Laboratorio Ricerche, via F.Nullo 8, 25126 Brescia [Italy] 2: Dipartimento di Biologia, Università degli Studi di Trieste, via L.Gorgieri 10, 34127 Trieste [Italy].

Standby Mode of HBGS Operations

During the HBGS standby mode of operation, a generating unit does not generate electricity. However, the station's equipment is operated at a level of readiness that allows the unit to begin generating electricity on short notice. While in standby mode, the generating station may discharge only 127 MGD of seawater (the equivalent of one unit/two pumps on-line). If the HBGS is not generating electricity and is in standby mode, the temperature of the discharge is approximately the same as the ambient seawater temperature entering through the intake. The frequency and duration of standby mode operation is driven by the grid's demand for electricity. Historically, this scenario has occurred less than one percent of the time.

Heat Treatment Mode of HBGS Operations

HBGS periodically conducts a heat treatment procedure to further control the growth of bio-fouling organisms that attach to the walls of the generating station intake structure and cooling water conduits. The larger bio-fouling organisms or macro-fouling organisms (primarily barnacles and mussels in the case of HBGS) attach themselves to surfaces within the cooling water system and can restrict water flow and interfere with the operation of facility equipment (pumps, valves, etc.). If the shells of these organisms are detached from the substrate, they can be carried by the cooling water flow to the condensers where they can clog tubes and degrade the performance of the condensers. Heat treatments are typically completed once every six to eight weeks. The entire procedure takes about six to eight hours to complete. Heat treatment is a routine operation at many of California's coastal generating stations and is permitted and regulated under the HBGS' NPDES permit conditions.

The main goal of heat treatment is to remove the marine organisms that have settled within the generating station's cooling water system while they are still small enough to detach and pass through the condenser tubes without clogging the tubes. During heat treatment, flow is reversed within the cooling water system and seawater is drawn into the system via the discharge conduit and discharged out of the intake conduit. Only a very small amount of seawater flow is actually taken from the ocean during this process, and most of the cooling water flow is circulated within the generating station system rather than discharged from the generating station. By recirculating the seawater flow through the condensers, rather than discharging it to the ocean, the seawater temperature in the recirculation loop is raised from ambient ocean water temperature to approximately 110–115°F (43–46°C). The elevated water temperature removes the marine organisms within the system, which are then discharged through the intake structure.

HBGS Historical Operations

As stated above, the HBGS has been in operation since 1958. All four generating units were on-line until 1995. At that time Units 3 and 4 were taken off-line due to limited use. Units 3 and 4 were retooled and brought back on-line in 2002 and 2003, respectively. The HBGS facility flow rate from the period 1979 through 2002 (prior to retooling) averaged 234 MGD, with a low flow of 127 MGD. From 2002 to July 2003 (during and subsequent to retooling) the average flow rate has increased to 265 MGD, with a low flow of 127 MGD. From 1980 through July 2003, HBGS pumps have been in operation approximately 98.8% of the time. Like all large facilities, there are scheduled outages so that maintenance needs can be performed on the system (refer Appendix C, *HYDRODYNAMIC MODELING REPORT*).

HBGS Future Operations

As discussed in Section 2 of the *REPORT ON LOCAL AND REGIONAL ELECTRIC POWER REQUIREMENTS AND GENERATION RESOURCES* (refer to Appendix Q), there are a number of factors that would likely result in continued operation of the HBGS units for the next several years and the foreseeable future. These are summarized as follows:

Reliability:

- Two of the four units at the HBGS have received Reliability Must-Run (RMR)[3] contracts from the California ISO for each of the last four years;
- In addition to the above, an existing ISO Operating Procedure[4] requires that two units at the HBGS or one HBGS unit plus a 320 MW unit at the Alamitos Generating Station be on-line during peak load conditions on the SCE system.
- On a going forward basis it would appear as though at least two HBGS units would be considered RMR and at least one unit would be required to meet the requirements of the ISO Operating Procedure unless other generation were added in the same geographic area or if SCE were to make additions and/or modifications to the transmission system into and within the area. At present there are no announced plans for either to occur.

Existing Power Contracts:

- At the present time there is a power supply contract between the State of California and Williams Energy Marketing and Trading[5] that extends through 2018 and for which HBGS provides a portion of the capacity;
- At the present time the output of HBGS Units 3 and 4 is being sold to SCE under the terms of a five-year tolling agreement which expires in 2008.[6]

Serving Long-Term Load Requirements:

- There would be a significant need for generation resources located within Southern California to serve the projected area loads. Because of the nature of the SCE transmission system these generation resources would have to include either existing or new generation in the Orange County area to avoid significant transmission system investments and to provide the same reliability benefits as HBGS Units 1 and 2.

Regulatory Status of the HBGS Units:

- HBGS Units 3 and 4, which had been shut down by SCE in 1995, have been refurbished by AES and were placed in operation in July of 2002 and August of 2003, respectively.[7] In 2001 these units received a certificate from the California Energy Commission (CEC) that allows them to operate for an initial period of 10 years with conditions.

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3 RMR units are those that have been identified by the ISO as required to be on-line to maintain local area reliability in the event a forced outage should occur on a transmission element or a generator in the local area.
4 ISO *Management Recommendations for 2004 RMR Designations from the LARS Process* (September 19, 2003); Page 35.
5 Williams Energy Marketing and Trading is an entity in the business of buying and selling natural gas and electricity.
6 A tolling agreement is one in which the entity receiving the output from a generating facility owned by another party supplies the fuel which is burned in the generating facility.
7 *Energy Facility Status* summary, California Energy Commission, June 30, 2004.

- ❖ Because HGBS Units 1 and 2 were not removed from service prior to their acquisition by AES it was not necessary for them to go through a CEC certification process in order to continue to operate. Therefore, the regulatory life of these units is indefinite, as long as they comply with the pertinent air and water permits.

Siting Issues for New Generation:

- ❖ A developer/electric utility would likely face significant difficulties in siting a new generating facility in Orange County that would provide the same system support benefits, as does the HBGS facility.

4.2 PIPELINE ROUTE

In addition to the desalination facility site, the proposed project would include up to approximately 10 miles of water delivery pipeline. The water delivery pipeline would extend from the proposed desalination facility to the OC-44 water transmission line within the City of Costa Mesa, east of State Route 55 (SR-55) at the intersection of Del Mar Avenue and Elden Avenue. The proposed pipeline alternatives (refer to Exhibit 3-3, *CONCEPTUAL PIPELINE ALIGNMENTS*) are proposed to be routed primarily within existing street right-of-way and easements. However, portions of the pipeline alignments are proposed to be installed within areas of the Costa Mesa Country Club (Costa Mesa) and Fairview State Hospital (Costa Mesa). As described in Section 3.0, Project Description, the following streets are proposed to be included in either the primary or alternate pipeline route:

Primary Route

Newland Street
Hamilton Avenue
Brookhurst Street
Adams Avenue
Placentia Avenue
Harbor Boulevard
Fair Drive
Del Mar Avenue and
Elden Avenue

Alternate Route

Hamilton Avenue
Victoria Street
Harbor Boulevard
22nd Street
Del Mar Avenue
Elden Avenue

SURROUNDING ADJACENT LAND USES

Uses surrounding the proposed pipeline route are dependent upon the pipeline alignment selected, although these include primarily residential areas, with some commercial/industrial uses, schools, parks, and flood control facilities.

4.3 UNDERGROUND BOOSTER PUMP STATIONS

Two off-site underground booster pump stations are needed as part of the distribution system. The first off-site underground booster pump station (the "OC-44" pump station) is proposed to be located within an unincorporated area of the County of Orange along the eastern border of the City of Newport Beach, within an Orange County Reserve Preservation Easement. The site is located adjacent to, but outside of, a Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) area (refer to Exhibit 3-4, *OC-44 BOOSTER PUMP STATION LOCATION MAP*). An inventory of existing biological and cultural resources within the vicinity of the OC-44 pump station is included in Section 5.9, *CONSTRUCTION RELATED IMPACTS*. The second underground booster pump station (the "Coastal Junction" pump station) would be located in the parking lot at St. Paul's Greek Orthodox Church, at 4949 Alton Parkway within the City of Irvine (refer to Exhibit 3-5, *COASTAL JUNCTION BOOSTER PUMP STATION LOCATION MAP*).

SURROUNDING ADJACENT LAND USES

Land uses adjacent to the OC-44 booster pump station include open space to the north, south, and east, and residential to the west. The Coastal Junction pump station site is surrounded by the St. Paul's Church to the south, the Woodbridge Village Association to the west, an apartment complex to the east, and open space to the north. Refer to Exhibit 3-4, *OC-44 BOOSTER PUMP STATION LOCATION MAP,* and Exhibit 3-5, *COASTAL JUNCTION BOOSTER PUMP STATION LOCATION MAP*, for additional information.

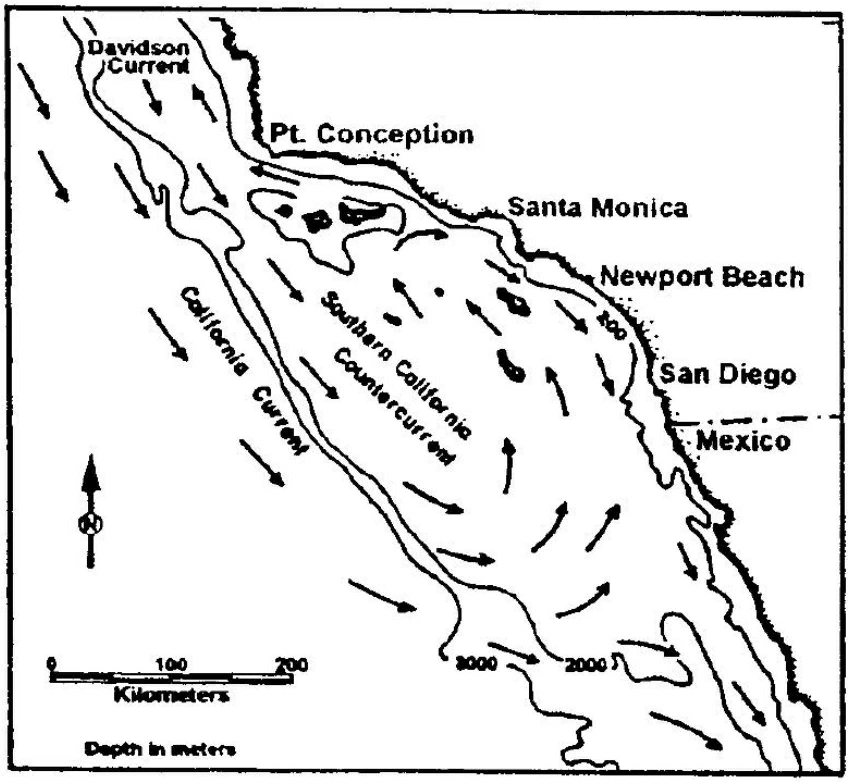
4.4 LOCAL MARINE SPECIES AND COMMUNITIES OCCURRING IN THE WATERS AT HUNTINGTON BEACH

THE SOUTHERN CALIFORNIA BIGHT

All of the marine species living near the HBGS commonly occur over geographic ranges extending well beyond the coastal waters of Southern California. They are part of a biologically and climatologically unique region called the Southern California Bight (SCB). Geographically, the SCB is an open embayment extending from Point Conception, CA into Baja California, Mexico and 125 miles offshore (refer to Figure 4-1, *SOUTHERN CALIFORNIA BIGHT* (Carlucci et al., 1986; Jackson, 1986). Biologically, the SCB is a transition-zone species assemblage positioned between two larger and diverse assemblages; one in the cooler waters to the north and the other in the warmer waters to the south. SCB organisms comprise a mix of species: some from the cooler, northern region and some from the warmer, southern region.

Physical, biological, and oceanographic factors affect the total SCB biomass and cause year-to-year variation in the number of species occurring within the SCB and in areas such as Huntington Beach. While ocean temperature, current patterns, and upwelling affect nutrient and food supplies, biological variables such as the arrival of planktonic animals to coastal areas, the recruitment of new organisms (addition of young-of-the-year to the population) and habitat availability and quality all influence ecosystem-species composition, diversity, and biomass (Jackson, 1986). The young stages of most marine invertebrates and fishes living at and near Huntington Beach and throughout the SCB begin life as drifting plankton. Their survival into the next life stage requires that the appropriate and vacant habitat be found. Thus, evaluation of either local or regional habitats with respect to their biodiversity, the abundances of different species, and the age, body size, and growth rates of specific organisms must always be made in the context of the large-scale influences, whether in the area around Huntington Beach or across the entire SCB.

Figure 4-1
SOUTHERN CALIFORNIA BIGHT



MARINE ORGANISMS AND THE HABITAT OCCURRING IN THE OCEAN WATERS NEAR THE HBGS OUTFALL

Since 1975 National Pollutant Discharge Elimination System (NPDES) requirements for HBGS receiving water monitoring have been carried out by Marine Biological Consultants (MBC) Applied Environmental Sciences (Costa Mesa, CA). Annual reports by MBC (a complete list of these annual reports is contained the bibliography of Appendix C, *HYDRODYNAMIC MODELING REPORT*) have monitored the abundance, diversity, and health status of marine organisms inhabiting the waters and substrata surrounding the HBGS. In addition to recording environmental conditions and censusing the organisms living near the HBGS heated discharge, MBC sampling has been done at locations 3,000 feet north and south of the discharge. The sampling methods have included diver surveys along bottom transects, trawling for the census of fishes and macroinvertebrates, and bottom-core samples to assess the number and diversity of animals living within the substrate.

Over the years, as monitoring results consistently indicated the absence of discharge effects, the number of surveys required by NPDES was reduced. The MBC report for 1993 contains the most recent analysis of the benthic infauna (i.e., organisms living in the substrate). The 2001 report has the most recent findings of the trawling and diving surveys of benthic macroinvertebrates.

The sea floor (benthic habitat) surrounding the HBGS discharge is relatively smooth and gently sloping, and contains medium to fine-grain sands. It extends for a considerable distance, both up and down the coast from the discharge site. Littoral currents sweep the waters overlying the coastal sea floor in a generally downcoast direction, although net movement is affected by tides, winds, and storms. These factors and sand grain size play a major role in determining the distribution, abundance, and diversity of benthic animals.

The marine organisms living in the vicinity of the HBGS discharge occur in one of three habitat classifications: 1) substrate (termed infauna); 2) on the seafloor (termed macroinvertebrates, including worms, crabs, sand dollars, starfish and some fishes); or 3) in the water column itself (consisting of squid, fish, plankton, etc.). General descriptions of these three habitat classifications are provided below. However, more detailed information is provided in Section 5.10, *OCEAN WATER QUALITY AND MARINE BIOLOGICAL RESOURCES*.

1. **Infauna** Huntington Beach infauna surveys were carried out from 1975 to 1993 (MBC, 1993). This habitat is dynamic and there are many species that can potentially occur in the infauna, however, many of these are rare or appear episodically. Most of these animals have very short lives and it is reasonable to assume that many of them arrive each year in the plankton. Thus, the infaunal species diversity of the extended habitat varies from year to year as does organism age, size, and abundance.

In terms of both numbers and species, the most dominant animals each year were polychaete worms and crustaceans. Mollusks were the third most abundant group and showed marked variation from year to year.

2. **Benthic macrofauna** Macrofaunal surveys, conducted from 1975 to 2000, show the repeated occurrence of the same core group of species in the area (MBC, 2001). The macrofaunal species occurring at Huntington Beach are typical of those expected to occur at other comparable open, sandy bottom habitats throughout the SCB. Average abundances of these and other organisms and total species number varied from year to year.

From 1975 to 2001, five animal groups (three annelid [polychaete] worms [Diopatra, Owenia, Maldanidae], hermit crabs [Paguridae] and Pacific sand dollars [Dendraster excentricus]) account for about 90% of the marcrofaunal abundance.

3. **Fishes** Since the fish surveys began, 65 species have been collected, all of which can be considered as typical residents of open, sandy bottom coastal habitats in southern California (Horn and Allen, 1978; Mearns, 1979; Allen and DeMartini, 1983). The fifteen most abundant fish species living in the area between 1976 and 2000 are: white croaker, queenfish, northern anchovy, California halibut, Pacific sardine, speckled sanddab, curflin turbot, kelp pipefish, white seaperch, walleye surfperch, C-O turbot, Pacific butterfish, California lizard fish, salema, and barred surfperch

4.5 HUNTINGTON BEACH SURF ZONE STUDIES

HUNTINGTON BEACH SURF ZONE – ELEVATED BACTERIA LEVELS

Huntington State Beach was closed from July 1, 1999 until September 3, 1999 due to elevated levels of fecal indicator bacteria in the surf zone. Fecal indicator bacteria (total coliform, fecal coliform, and Enterococcus) live in the digestive tracts of warm-blooded animals, including humans. The Orange County Health Care Agency (OCHCA) suspected that there was a source of human wastewater that was contributing the high bacterial levels.

Elevated bacteria levels have resulted in chronic beach postings advising visitors against swimming for the last four years. Huntington State Beach is heavily used with over five million visitors per year. Surf zone pollution severely affects the economy of the City of Huntington Beach when the beach is closed or advisories have been posted. It is estimated that as many as 50,000 people per year may suffer from gastroenteritis as a result of ingesting bacteria while swimming and surfing in this water (Kim et. al., 2003).

Monitoring for fecal indicator bacteria is conducted three to five times per week in ankle deep water approximately every 3,000 feet along the shoreline of Huntington State Beach by the OCSD. OCHCA decides whether to notify the public (via beach postings) that the water may not be safe for swimming based on a comparison of the bacteria data to state standards, as shown in Table 4-2, *STATE STANDARDS FOR BEACH POSTINGS*. If OCHCA knows or suspects that human wastewater may be responsible for the high levels of bacteria, the beach is closed for body contact recreation.

Table 4-2
STATE STANDARDS FOR BEACH POSTINGS

Fecal Indicator Bacteria	Single Sample Maximum	Monthly Geometric Mean
Total Coliform, MPN/100 ml	10,000	1,000
Fecal Coliform, MPN/100 ml	400	200
Enterococcus, CFU/100 ml	104	35

MPN = Most Probable Number. The MPN technique provides a "statistical picture" of the number of coliforms present and is not an exact measurement.
CFU = Colony Forming Units. The CFU technique counts colonies of a bacteria within a sample. It is not an exact measurement of bacteria.

OCHCA summarized the beach monitoring data for 2000 through 2003 in their 2003 Annual Report (OCHCA, 2004). The data collected between Beach Boulevard (located approximately one-half mile northwest of HBGS) and the mouth of the Santa Ana River (located approximately two miles southeast of the HBGS) were combined and are presented in Table 4-3, *BEACH POSTINGS FROM APRIL TO OCTOBER IN 2000 TO 2003*.

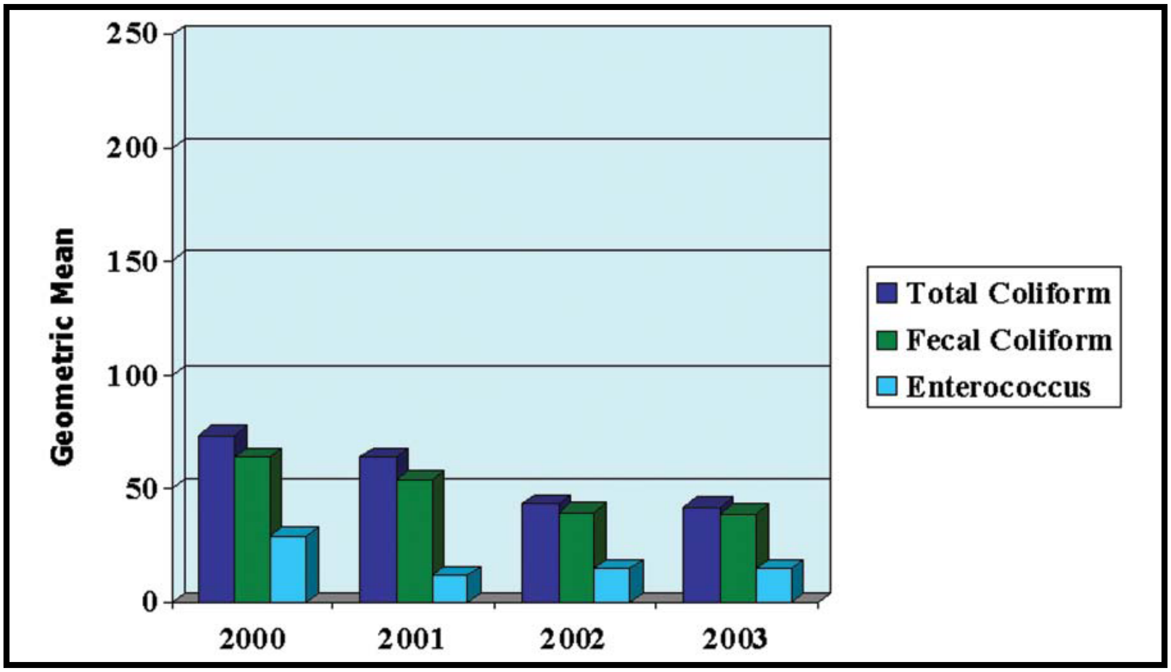
Table 4-3
BEACH POSTINGS IN HUNTINGTON BEACH FROM APRIL TO OCTOBER

Year	Postings	Days	Beach Mile Days
2000	28	223	67.6
2001	29	70	14.8
2002	31	89	23.8
2003	21	72	41.9

The number of "beach mile" days is an indicator of the extent of the problem. It is calculated by multiplying the number of days the beach is posted by the number of miles that are posted. As shown in Table 5.10-2, there was a large decrease in both the number of days and the number of beach mile days between 2000 and 2001. This was the period when dry weather urban runoff was first diverted to OCSD for treatment rather than discharged to the ocean via the Santa Ana River or Talbert Marsh. For the last three years there has been an increasing trend in the number of beach mile days.

Figure 4-2, *GEOMETRIC MEANS FOR FECAL INDICATOR BACTERIA AT HUNTINGTON STATE BEACH (STATION 6N)* presents data from the OCHCA Annual Report on the mean concentrations of each of the three fecal indicator bacteria for 2000 to 2003 at Station 6N which is 3000 feet downcoast from the HBGS. This figure shows that total coliform and fecal coliform bacteria levels have decreased substantially. There was a decrease in Enterococcus between 2000 and 2001 but for the last three years the levels have remained fairly constant. Most of the postings during the last four years were due to exceedences of the Enterococcus standard.

Figure 4-2
GEOMETRIC MEANS FOR FECAL INDICATOR BACTERIA AT HUNTINGTON STATE BEACH (STATION 6N)



* AB 411 Periods (4/1 through 10/31), 2000-2003

An analysis of the large amount of bacterial data that have been collected has shown that bacteria levels are highest in the surf zone during spring tides and lowest during neap tides. In addition, fecal indicator bacteria are significantly higher at night and lower during the day, presumably because of sunlight-induced mortality.

A number of potential sources of the fecal indicator bacteria have been investigated in studies funded by OCSD and others over the last four years. Each of these sources and the most recent information on their potential to contribute fecal indicator bacteria at Huntington State Beach are described below.

Urban Dry Weather and Storm Water Runoff

The Santa Ana River drains a highly urbanized watershed of 1,700 square miles and discharges to the ocean approximately 9,000 feet from the intake to the HBGS. The Greenville Banning Marsh is located east of the Santa Ana River and drainage from the marsh flows into the Santa Ana River through a diversion channel. The Huntington Beach and Talbert flood control channels discharge into the Talbert Marsh, which discharges to the ocean approximately 1,300 feet upcoast from the Santa Ana River.

Flows from the Santa Ana River and Talbert Marsh are tidally influenced in both dry and wet weather conditions. Ocean water flows inland up the river during flood tides and mixes with water from the river, which is heavily dominated by urban runoff. The mixture of ocean water and river water flows back through the river outlet during ebb tides and contaminants from the watershed enter the surf zone. Contaminants in the surf zone are transported parallel to the shore by wind and wave-driven currents in a direction controlled by the angle at which waves approach the shore. Other mechanisms such as rip and undertow currents carry contaminants offshore. A fraction of the contaminants carried offshore is returned to the surf zone (Kim, et. al., 2004).

Contaminants from the Santa Ana River and Talbert watersheds that flow into the nearshore ocean during ebb tides can be transported upcoast toward Huntington State Beach during the following flood tide. Peak longshore tidal velocities are in the range of 0.2 to 0.3 meters per second during spring tides (Kim et. al., 2004). This means that during one tidal cycle, contaminants can be transported four to six kilometers upcoast. Monitoring station 9-North (9N) is adjacent to the HBGS and is located 1.5 miles upcoast from the Santa Ana River outlet.

Four separate field studies were conducted by U.C. Irvine during the summer of 2001. Over 2000 samples were collected and analyzed for total coliforms, E.coli (a subset of fecal coliforms) and Enterococci bacteria. These studies determined that fecal indicator bacteria in the surf zone are highly variable and governed by a complex set of environmental conditions, including the input of bacteria to the surf zone during ebb tides, the magnitude of coastal currents, and the prevailing wave direction (Kim, et.al. 2004). The concentration of total coliforms is highest during the transition from the nighttime falling to rising tide and mostly confined to the region of the surf zone upcoast of the Santa Ana River and Talbert Marsh outlets. Results indicate that total coliforms enter the nearshore ocean from the Santa Ana River and Talbert Marsh during ebb flows and are carried upcoast by wave driven surf zone currents and/or tidally driven coastal currents. The patterns for E.coli and Enterococcus are different than the total coliform pattern. The concentrations of E.coli and Enterococcus are highest in the region between 6N (near Magnolia Street) and 9N. Based on a detailed analysis of the data collected in 2001 and on modeling studies, it appears that there are potentially other sources of E.coli and Enterococcus in the vicinity of stations 6N and 9N. A microbial source tracking study concluded that human wastewater was the source of a portion of the bacteria in the vicinity of 9N (Kim et. al., 2004).

During storm events, significant amounts of bacteria are delivered to the surf zone. One study estimated that on an annual basis over 99 percent of the fecal bacteria are delivered in storm events with less than one percent delivered during dry weather conditions (Reeves, et. al., 2004). Although bacteria standards are exceeded after storm events, fewer people are impacted because most usage of the ocean occurs during the dry spring and summer months. However, the contaminated sediments and particles that enter the nearshore ocean during storms could be deposited and lead to chronic contamination of beach areas located near the Santa Ana River and Talbert marsh outlets.

Beginning in 1999, the City of Huntington Beach and County of Orange began diverting dry weather runoff to OCSD for treatment and offshore disposal. Thirteen diversion facilities, including ten pump stations and three in-channel diversion facilities were constructed at a cost of approximately $7.5 million (County of Orange, et. al., 2004). These facilities collect urban runoff from approximately 90 percent of the watershed area and divert up to 2.4 MGD of dry weather runoff to the OCSD system. All diversions are terminated during storms, which generally occur from November to March. A study of the effectiveness of the diversions in the Talbert Marsh watershed, conducted by U.C.

Irvine, showed that the diversions reduced the flow of fecal indicator bacteria from urban runoff to the outlet of Talbert Marsh. During the three years of the study, the concentrations of the three indicator bacteria increased in urban runoff stored in the forebays of the channels that drain the Talbert watershed. However, in general, the average concentrations of fecal indicator bacteria did not change significantly at the coastal outlet of Talbert Marsh. This indicates that the diversions were effective in controlling the flow of fecal indicator bacteria from urban runoff in the Talbert watershed but there may be other sources of fecal indicator bacteria, such as bird droppings or regrowth of bacteria in sediments.

The County of Orange and the Cities of Costa Mesa and Newport Beach recently submitted a workplan to the Santa Ana Regional Water Quality Control Board (SARWQCB) to address dry weather runoff from the areas where runoff is currently not diverted, which equates to approximately 10 percent of the watershed (County of Orange, et. al., 2004). These areas are adjacent to the Greenville-Banning Channel and lower Santa Ana River downstream of the existing in-channel diversion dams.

OCSD Discharge

At the time of the beach closure in 1999, OCSD was discharging 245 mgd of wastewater at an outfall that is located 4.5 miles offshore at a depth of 195 feet. At that time, all wastewater received primary treatment and 50 percent of the wastewater also underwent secondary treatment. OCSD also has an emergency outfall that is closer to shore but it has not been used since construction of the deep outfall. During early investigations of high levels of bacteria in the surf zone, OCSD maintained that the OCSD discharge could not be the cause because: 1) the discharge plume was contained below the thermocline and could not mix with surface waters; 2) intensive monitoring offshore and nearshore showed no indication of bacteria traveling from offshore to the nearshore zone; and 3) other water quality monitoring efforts conducted by OCSD had never detected the plume near the shore.

Stanley Grant, a professor at U.C. Irvine, advanced a theory that a submerged edge of the OCSD wastewater plume may be transported shoreward by subsurface currents and then entrained in the discharge from HBGS and transported into the surf zone (Grant et. al., 2000). Intensive monitoring conducted by the U.S. Geological Survey (USGS) in 2001 did not identify a connection between ocean processes and bacterial contamination of the beach (USGS, 2003). The OCSD plume rises toward the thermocline when it first enters the ocean because it is less saline and warmer than ocean water. The plume mixes with ocean water that is about 12 to 14 degrees Celsius and is generally carried out of the area by alongshore currents. Although internal tides were shown to intermittently transport cold water toward the shore in July and August 2001 and the OCSD plume is occasionally detected in shallow water (20 meters), there is no connection between the cold water intrusions and exceedences of beach standards. Intensive bacteria monitoring conducted during the summer of 2001 showed that when the beaches have high bacteria levels, water about 0.4 kilometers from the beach also has measurable bacteria, although well below the beach standards. There was a gap between the nearshore contamination and the bacteria measured 3.3 kilometers offshore below the thermocline in the OCSD plume. The lowest levels of bacteria were consistently found about 0.8 kilometers from the beach. This gap indicates that the bacteria from the OCSD outfall do not reach the beaches (OCSD, 2002).

In August 2002 OCSD began disinfecting its effluent with chlorine to determine if there was any undetected mechanism by which the effluent plume was reaching the surfzone in an effort to ensure that OCSD was not a contributor to the exceedence of bacteria standards. OCSD has set a goal of meeting the shoreline standards in the zone of initial dilution around the outfall (OCSD website). The daily operational goals for the final effluent are shown in Table 4-4, *OCSD TREATMENT FACILITY OPERATIONAL* GOALS. The total coliform, fecal coliform, and enterococcus levels in the final effluent are generally far below the goals. Bacteria levels at nearshore monitoring stations have continued to exceed beach standards since OCSD began disinfecting its wastewater. This supports the previous studies that concluded that the OCSD plume was not the source of the nearshore bacteria. OCSD is also taking steps to treat 100 percent of the wastewater to secondary standards. At the end of 2003, 64 percent of the wastewater received secondary treatment and 36 percent received primary treatment.

Table 4-4
OCSD TREATMENT FACILITY OPERATIONAL GOALS

Indicator Bacteria	Beach Sanitation Standards (30 day geometric mean after initial dilution of 180:1)	Daily Operations (Target at the final effluent sampler using 100:1 dilution)
Total Coliform, MPN/100 ml	180,000	<100,000
Fecal Coliform, MPN/100 ml	36,000	<20,000
Enterococci, MPN/100 ml	6,300	<3,500

Wastewater Collection System

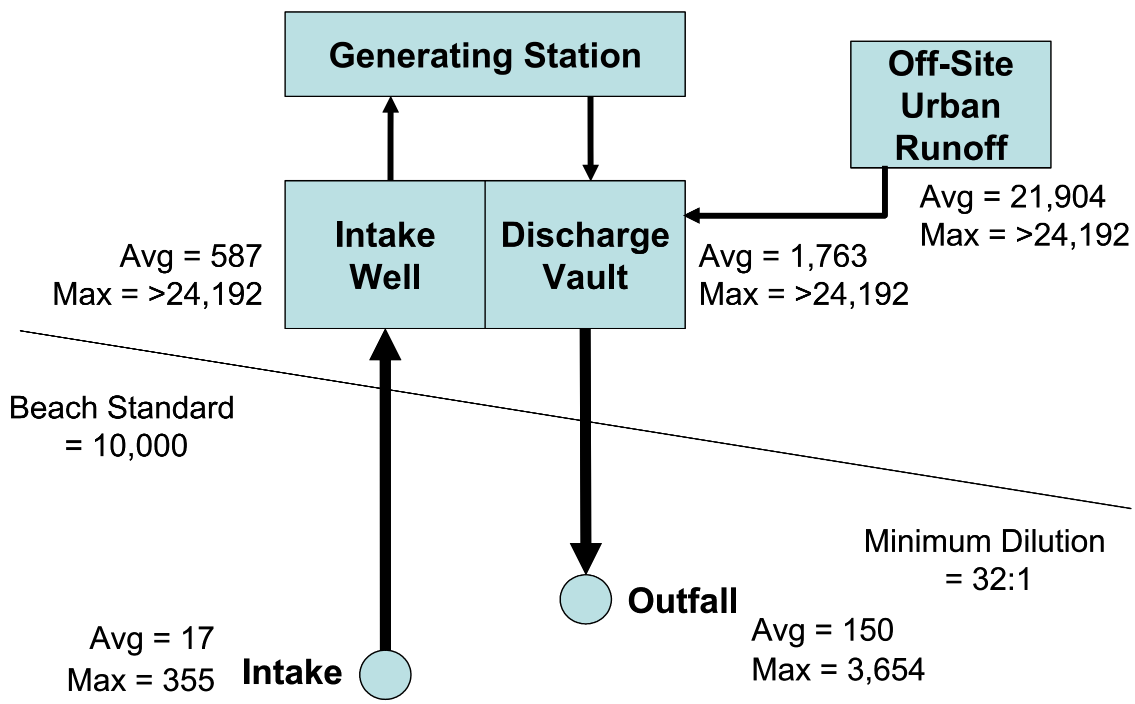
During the Phase I bacterial investigation in 1999, closed circuit television inspection of OCSD’s coast trunk line that runs along Pacific Coast Highway revealed no leaks. No leaks were detected in OCSD’s outfall. A small leak was found in the Huntington State Beach restroom system and was fixed. During the summer of 2001 the Huntington State Beach restrooms and sewers along the Pacific Coast Highway near the HBGS were tested for leaks using hydrostatic, air pressure, and dye testing methods. Sewer lines between several restrooms were leaking with the most severe leak in 800 to 900 feet of sewer line connecting two restrooms that are near HBGS and adjacent to Station 9N. The dye testing revealed that wastewater flowed from the restrooms to the shoreline via the tidally influenced groundwater near the beach. Dye was detected in groundwater monitoring wells near the restrooms and in the surf zone within 48 hours of injection at the restrooms (OCSD, 2002). These studies indicated that the restroom sewers could potentially be a source of bacteria to the shoreline, and may be the additional source of E.coli and Enterococcus between Stations 6N and 9N discussed above. OCSD recommended that the California Department of Parks and Recreation (California State Parks) take corrective measures to eliminate the leaks and to routinely test their sewers in the future. California State Parks closed the restrooms with the leaking sewers and submitted plans to abandon the leaking sewer near the HBGS and replace it with a direct connection to OCSD’s coast trunkline.

HBGS

There has been considerable speculation that the HBGS in someway contributes to the bacterial contamination of the nearshore ocean around monitoring station 9N, either as a source of bacteria or by “sucking” in the OCSD plume and then discharging it in nearshore waters. USGS conducted an intensive ocean monitoring program in the summer of 2001 to determine if the OCSD plume could potentially reach the shore. USGS concluded that the interaction of the HBGS and the OCSD plume could not be responsible for the beach contamination (USGS, 2003).

MBC conducted a water quality monitoring program during the summer of 2001 to identify potential sources of bacteria at the HBGS. MBC found high concentrations of fecal indicator bacteria in the HBGS discharge vault and determined that the sources of the bacteria were the HBGS retention basins and the off-site Pacific Coast Highway (PCH)/Newland Street storm drain that flows into the HBGS discharge vault. The PCH/Newland Street storm drain collects urban runoff from an area west and north of HBGS, including the adjacent RV/trailer park. Although high levels of fecal indicator bacteria were found in the discharge vault, intensive sampling of the ocean near the HBGS discharge revealed much lower concentrations. The total coliform data from the summer of 2001 are summarized on Figure 4-3, *TOTAL COLIFORMS AT HBGS, SUMMER 2001*. MBC concluded that the HBGS was not responsible for the bacteria contamination of the beach at Station 9N due to the dilution of the discharge with cooling water and with ocean water in the immediate vicinity of the outfall (MBC, 2002).

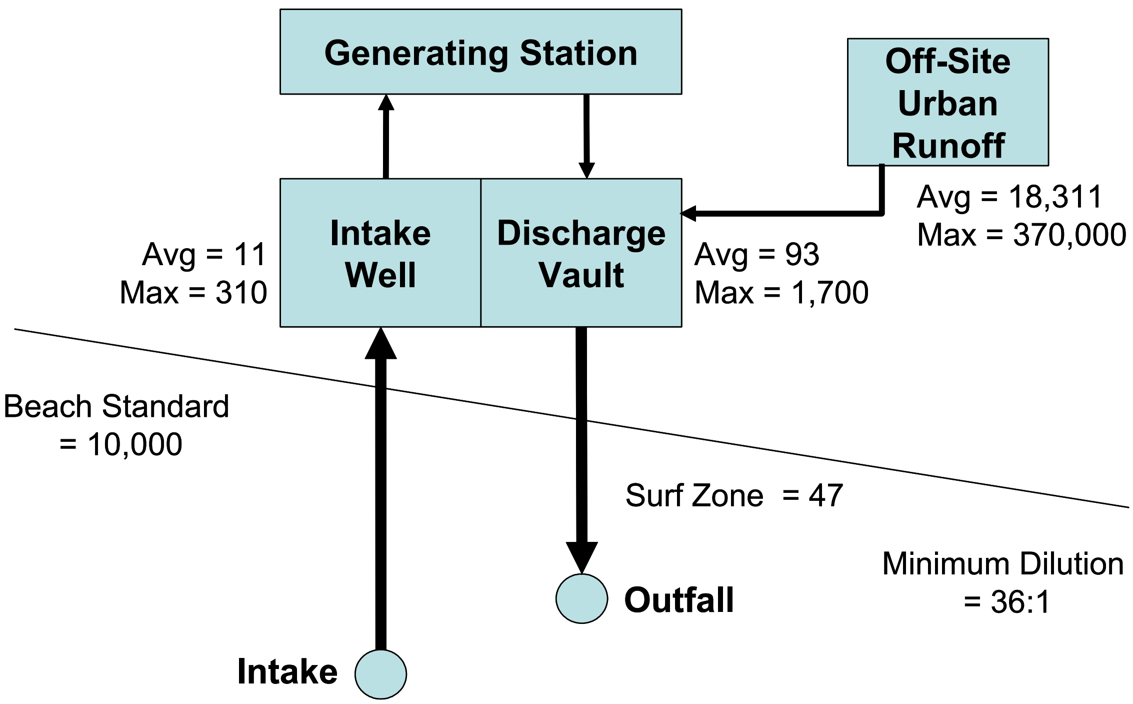
Figure 4-3
TOTAL COLIFORMS AT HBGS, SUMMER 2001 (in MPN/100ml)



The California Energy Commission (CEC) required a study of the impact of the HBGS on Huntington Beach bacterial contamination as part of the retooling of the generating station in 2001 (Komex, 2003). An intensive water quality monitoring program was conducted during the summer of 2002 and dye studies were performed to determine if the HBGS was a source of fecal indicator bacteria to the surf zone. Samples were collected daily from a number of locations at the HBGS from mid-July to mid-October. In addition, samples were collected every three hours from four locations during a two-week intensive study. Data were also collected in the ocean near the intake and outfall of the HBGS. The total coliform data for 2002 are summarized on Figure 4-4, *TOTAL*

COLIFORMS AT HBGS,SUMMER 2002. The study found that urban runoff from an area adjacent to the HBGS that is discharged to the discharge vault of the HBGS contained high levels of fecal indicator bacteria. Because the urban runoff is blended with cooling water from the generating station, the generating station discharge contained much lower concentrations of fecal indicator bacteria. These findings are consistent with the findings from the MBC study conducted the previous year.

Figure 4-4
TOTAL COLIFORMS AT HBGS, SUMMER 2002 (in MPN/100ml)



Komex (2003) conducted a dye study on the HBGS discharge to determine if the discharge has the potential to reach the surfzone. Dye was injected into the discharge vault at HBGS five times on one day in August 2002. The dye surfaced over the outfall and then spread radially in all directions. The average dilution between the discharge and the beach was 277 to one. The lowest calculated dilution was 36 to one. These results are consistent with the modeling conducted in Appendix C of the EIR, *HYDRODYNAMIC MODELING REPORT*. Based on the water quality sampling and the modeling studies, Komex concluded that the HBGS was not contributing to the beach contamination problem.

Bird Droppings

A two-week study in May 2000 showed that the Talbert Marsh is a source of total coliform, Enterococcus and E. coli (Komex, 2003). The study showed that the marsh produces about 100 billion of all three indicator bacteria each day. These organisms are transported to the ocean with each ebb tide. The source of the bacteria appears to be seagull feces, which are deposited in the marsh. Marine vegetation and marsh sediment become potential reservoirs of the bacteria. OCSD conducted bacteria monitoring upstream and downstream of the PCH bridge over the Santa Ana River in the summer of 2001. Bacteria levels downstream of the bridge were consistently and substantially higher than upstream levels. Birds roosting under the PCH bridge were thought to be a possible cause of the high levels downstream (OCSD, 2002).

There has also been speculation that bird droppings on the beach could be partially responsible for the high bacteria levels in the surfzone. During the summer of 2001, OCSD conducted visual observations of birds in the area between Stations 6N and 12N. Groups of up to 400 birds were observed on the beach and groups of 200 to 300 birds were observed floating in the water beyond the surfzone (OCSD, 2002). Bacterial monitoring studies were not conducted to determine the impact of bird droppings.

Pet Waste

There have been no studies in Huntington Beach on the potential contribution of pet wastes to bacteria in the nearshore ocean. A study conducted at the Dog Beach in San Diego found that areas with large accumulations of dog feces did not produce higher concentrations of bacteria than areas with low accumulations of dog feces. However, the study concluded that the combination of decaying marine vegetation, dog feces, and bird droppings in the kelp line was likely the source of bacteria at that beach (MBC, 2003).

Groundwater Discharge

During the summer of 2003, researchers from Stanford University conducted a study to determine if groundwater near Station 9N could transport fecal indicator bacteria to the surf zone (Boehm, et.al. 2003). Radium isotope studies were conducted to confirm that groundwater enters the surfzone during ebb tides. Groundwater samples were analyzed for fecal indicator bacteria. Most of the samples contained less than 60 MPN/100 mL (60 most probable number/100 milliliters) but one sample contained total coliform of greater than 24,192, fecal coliform of 17,329, and enterococcus of 776 MPN/100 mL. An experiment was conducted to determine if the sand at Huntington Beach would filter out Enterococcus as the groundwater moved through the sand. The experiment showed that Enterococcus are not filtered out and readily move through the sand with the groundwater. This study and the dye study conducted by OCSD in 2002 show that groundwater enters the surf zone near Station 9N. Groundwater entering the surf zone could transport bacteria from a variety of sources such as leaks in the wastewater collection system, bird droppings, and/or pet waste,

Conclusions

Based on the extensive studies conducted on bacterial pollution of Huntington State Beach, the Santa Ana River and Talbert Marsh appear to be the primary sources of fecal indicator bacteria to the near shore ocean. During the summer months, most of the dry weather runoff is currently diverted to OCSD although approximately 10 percent of the watershed near the mouth of the Santa Ana River still discharges to the river. Bird droppings and a reservoir of bacteria stored in the sediment and on marine vegetation may continue to be the source of bacteria at the mouths of the river and marsh. Modeling studies and monitoring data indicate that there is likely another unidentified source of bacteria in the vicinity of Stations 6N and 9N. Three separate studies conducted between 2001 and 2002 have demonstrated that HBGS is not the source of bacteria in the surf zone.

4.6 OCEAN WATER QUALITY AT THE HBGS INTAKE

There have been several efforts to characterize the intake and discharge water quality of the Huntington Beach seawater desalination facility. These efforts include: completion of sanitary survey (Appendix E), collection of desalination facility intake water quality information for two years, and operation of a seawater desalination pilot facility for the last two years.

There are a number of discharges and potential sources of contaminants in the vicinity of the HBGS intake (which would be the source of water for the desalination facility). Potential contaminant sources have been identified as:

- OCSD discharge;
- Urban dry weather and storm water runoff;
- Recirculation of HBGS discharge;
- Los Angeles/Long Beach Harbors;
- Cruise ships and/or fishing boats;
- Recreation; and
- Oil and gas activities.

These potential contaminant sources are evaluated in Section 5.10, *OCEAN WATER QUALITY AND MARINE BIOLOGICAL RESOURCES.*

4.7 OCEAN WATER QUALITY AT THE DESALINATION FACILITY INTAKE

The water quality at the desalination facility intake would potentially be affected by HBGS activities that occur between the ocean intake and the point at which water will be diverted from the HBGS cooling water system to the desalination facility. The intake water to the desalination facility would be cooling water taken after the water has flowed through the condensers of the generating station. Potential contaminant sources have been identified as:

- HBGS cycle water discharges;
- Urban runoff discharges from within the HBGS site;
- HBGS wastewater discharges;
- Hazardous materials spills at the HBGS site; and
- HBGS heat treatments.

Poseidon collected data on all of the water quality constituents that are regulated in drinking water supplies. Samples were collected from the HBGS intake vault and from the outlet to the condensers (where the desalination facility intake will be located). Analysis of impacts in this regard and the results of sampling are included within Section 5.10, *OCEAN WATER QUALITY AND MARINE BIOLOGICAL RESOURCES*.

4.8 ORANGE COUNTY WATER SUPPLY AND DISTRIBUTION SYSTEM

Through the collective efforts of more than 30 different water purveyors, four sources of water (imported water from the Metropolitan Water District of Southern California [MWD], surface water, groundwater and recycled water) are managed, treated and distributed to customers throughout Orange County. A list of water purveyors that manage the water supply and operate water distribution facilities in Orange County is provided below, while Figure 3-1, *ORANGE*

COUNTY WATER SUPPLY SOURCES, identifies the sources of water supply available to the County:

<u>Imported Supply:</u>

- MWD
- Municipal Water District of Orange County (MWDOC)

<u>Groundwater Management:</u>

- Orange County Water District
- San Juan Basin Authority

<u>Retail Delivery</u>:

- Anaheim, City of
- Brea, City of
- Buena Park, City of
- Capistrano Valley Water District
- East Orange County Water District
- El Toro Water District
- Fountain Valley, City of
- Fullerton, City of
- Garden Grove, City of
- Huntington Beach, City of
- Irvine Ranch Water District
- La Habra, City of
- La Palma, City of
- Laguna Beach County Water District
- Mesa Consolidated Water District
- Moulton Niguel Water District
- Newport Beach, City of
- Orange, City of
- San Clemente, City of
- Santa Ana, City of
- Santa Margarita Water District
- Santiago County Water District
- Seal Beach, City of
- Serrano Water District
- Southern California Water Company
- South Coast Water District
- Trabuco Canyon Water District
- Tustin, City of
- Westminster, City of
- Yorba Linda Water District

Imported Water

Imported water in Orange County is supplied by the Metropolitan Water District of Southern California (MWD). MWD only provides water to its member agencies. There are four MWD member agencies in Orange County: the Cities of Anaheim, Fullerton, and Santa Ana, and the MWDOC. MWD provides imported water directly to the three cities, and the three cities distribute that water to their retail customers. The rest of Orange County receives its MWD imported water through MWDOC.

MWDOC is a wholesale water agency charged with providing imported water to 27 different retail water purveyors in Orange County (refer to the list of member agencies above). As the second largest MWD member agency, MWDOC coordinates and plans water management programs throughout Orange County and represents all of Orange County's retail water purveyors (except Anaheim, Fullerton and Santa Ana and the Orange County Water District [OCWD]) to MWD.

MWDOC does not directly operate any imported water delivery facilities. Instead, Orange County's imported water supply is transferred directly to the retail water purveyors via MWD's facilities.

Imported MWD water consists of surface water from Northern California and Colorado River water. This water is transported over many miles, blended together, and then delivered throughout Orange County via two major water transmission pipelines: the Orange County Feeder and the East Orange County Feeder No. 2. Imported water that is treated at MWD's Jensen Plant in Granada Hills and Weymouth Plant in La Verne supplies the Orange County Feeder. Imported water that is treated at MWD's Diemer Filtration Plant in Yorba Linda supplies the East Orange County Feeder No. 2.

From these two major transmission pipelines, several important regional water pipelines are served through connections (or turnouts). The South County Pipeline (serving inland South Orange County), the Aufdenkamp Transmission Main (serving Laguna Beach) and the Tri-Cities Transmission Main (serving Laguna Niguel, Dana Point and San Clemente) are all supplied through connections to the East Orange County Feeder No. 2. In addition, the OC-44 Pipeline (serving Costa Mesa and Huntington Beach) is supplied through a connection (the connection is called "OC-44") near the end of the East Orange County Feeder No. 2. The Coast Supply Line (serving the coast from Newport Beach to Laguna Beach) is supplied through a connection near the end of the Orange County Feeder. The Irvine Cross Feeder allows for flexibility in distributing imported water through this regional system because it connects the East Orange County Feeder No. 2 and the Orange County Feeder. Exhibit 4-2, *IMPORTED WATER TRANSMISSION IN ORANGE COUNTY*, is a map depicting the imported MWD water distribution system in Orange County.

Surface Water

Orange County's main natural source of surface water is the Santa Ana River. The Santa Ana River is supplied by rainfall and snowmelt from the San Bernardino Mountains.[8] However, the Santa Ana River base flow is mainly comprised of treated wastewater discharged from treatment plants in Riverside County and San Bernardino County.

Santa Ana River water is not directly supplied to water customers in Orange County. Instead, as River water percolates in spreading basins operated by the OCWD, the River water becomes groundwater (the groundwater is then pumped through wells, treated and distributed to water customers as discussed below). An average of 200,000 acre-feet of River water percolates into the Santa Ana River Groundwater Basin each year.

Another source of surface water is the Santiago Creek, which is captured in the Santiago Reservoir (Irvine Lake) and provides approximately 8,000 acre-feet per year of supply.

8 Metropolitan Water District of Southern California, *Regional Urban Water Management Plan,* December 2000.

Insert Exhibit 4-2, IMPORTED WATER TRANSMISSION SYSTEM IN ORANGE COUNTY

However, this amount greatly varies dependent upon rainfall. About 3,000 acre-feet per year of this water is treated for and delivered to water customers by Serrano Water District while the remainder is sold for agricultural irrigation by the Irvine Ranch Water District (IRWD).[9]

Groundwater[10]

The Santa Ana River Groundwater Basin underlies the majority of the northern half of Orange County and provides almost half of all the total amount of water used in Orange County. Several smaller Orange County groundwater basins, such as those located in the San Juan Creek and Aliso Creek watersheds, are currently being studied to maximize their use and storage potential. The San Juan Basin is managed by the San Juan Basin Authority and its member agencies, while Aliso Creek has yet to establish a managing entity. Additionally, a portion of northern Orange County (the cities of La Habra and Brea and surrounding areas) overlies the San Gabriel Basin.

The OCWD was formed to protect Orange County's rights to water in the Santa Ana River and to manage the Santa Ana River Groundwater Basin ("Basin") underlying north and central Orange County.[11] Basin groundwater reserves are maintained by OCWD through a recharge system that replaces water pumped from wells. The groundwater recharge system consists of approximately 1,100 acres of recharge spreading facilities located in and adjacent to the Santa Ana River and Santiago Creek.[12] Each spreading system consists of a series of spreading basins, either shallow or deep, whose side-walls and bottoms allow for percolation into the underlying aquifer. Water enters the facilities from the Santa Ana River downstream of Prado Dam, and then flows by gravity through pipeline or overflow weir to the various recharge basins.

In 1965, OCWD installed injection wells along the coast near the mouth of the Santa Ana River (at a place called the "Talbert Gap") to pump water into the shallow aquifers. Injecting water into the shallow aquifers produced a groundwater mound that stood higher than sea level. With a barrier in place to retard seawater intrusion, it became feasible to draw water levels down during dry periods when local surface water and imported water sources were in short supply, instead of simply keeping the Basin as full as possible to prevent seawater intrusion. During wet periods, the depleted aquifer could be replenished with storm runoff and excess imported water. Utilizing this method of groundwater management, OCWD allowed the amount of depleted groundwater supply (basin overdraft) to fluctuate between "full" in 1969 to an overdraft of nearly 500,000 acre-feet in 1977 without causing irreparable damage to the resource.[13]

Groundwater withdrawals from the Basin have increased from less than 200,000 acre-feet per year in the early 1960s to more than 350,000 acre-feet per year in 2002. In comparison to the 350,000 acre-feet of annual withdrawals from the Basin during the period 1998-2002, the natural recharge is small (estimated by the OCWD to be about 70,000 acre-feet per year). The majority of replenishment water is from "artificial recharge" operations whereby OCWD captures the flow of the Santa Ana River (which currently averages about 150,000 acre-feet per year) in recharge facilities located in the river bed and through deep recharge basins (abandoned sand and gravel pits) near the river. OCWD also captures an average of about 50,000 acre-feet of storm flows each year. To make up for the imbalance between this 270,000 acre-feet of recharge and the 350,000 acre-feet of withdrawals, OCWD has purchased an average of 60,000 acre-feet of imported replenishment water from MWD each year for supplementary

9 Municipal Water District of Orange County, *2000 Regional Urban Water Management Plan Update*
10 The information in this section was reviewed and facts confirmed by John Kennedy of OCWD in September 2004.
11 *2020 Master Plan Report*, Orange County Water District, November 1998.
12 *2020 Master Plan Report*, Orange County Water District, November 1998.
13 *The Groundwater Replenishment System: Providing Water for the Future*, Orange County Grand Jury, 2003.

recharge primarily at its City of Anaheim and Orange recharge facilities. In addition the OCWD makes (via the first phase of the Groundwater Replenishment System [GWRS) and purchases approximately 20,000 acre-feet per year for injection in its seawater barriers.

If the accumulated overdraft becomes excessive, OCWD uses complex financial disincentives to discourage groundwater withdrawals. Since the 1997-98 water year (a wet year), the County has experienced dry conditions, resulting in overdrafts in excess of 30,000 acre-feet per year. Groundwater levels have declined more than 20 feet throughout the basin since 1998, and water levels near the coast are currently as much as 80 feet below sea level. In November 2002, the accumulated overdraft was estimated to be more than 400,000 acre-feet, which prompted OCWD to take actions to limit groundwater production rates and reduce the rate of withdrawal to about 324,000 acre-feet per year in 2003-04. Pumping for the current 2004-05 year has been limited to 316,000 acre-feet and is expected to fall to 311,000 acre-feet in 2005-06.

In comparison, the smaller groundwater basins in South Orange County, including Aliso Creek Basin and San Juan Basin, have been found to yield a total of 3,000 to 4,500 acre feet per year, dependent upon annual hydrology. Additionally, Orange County (the cities of La Habra and Brea and surrounding areas) receives approximately 12,000 acre-feet per year from the San Gabriel Basin, dependent upon annual hydrology.

It should be noted that minor portions of the Santa Ana River Groundwater Basin are contaminated and, therefore, not available to Orange County water customers. OCWD and the IRWD are currently implementing the Irvine Desalter Project (IDP) to clean up one such contamination problem. IDP is a joint groundwater quality restoration project funded with the participation of the U.S. Navy and MWD.[14] The IDP consists of two water purification plants with separate collection and transmission systems located near IRWD's headquarters on Sand Canyon Avenue in Irvine. One plant would remove the volatile organic compounds (VOCs) from the portion of the Basin that was contaminated by aircraft cleaning solvents used at the former El Toro Marine Base. IRWD would use that water only for irrigation and other non-drinking water uses. The other plant would treat water from outside the plume of contamination to remove salts and nitrates caused by the natural geology and past agricultural uses of the land. The water from outside the plume would be treated to drinking water standards and would be delivered to IRWD customers.

Recycled Water

Water recycling is a proven, effective drought-proof supply of water for Orange County. The foremost example of water recycling in Orange County is the GWRS, located in Fountain Valley. The GWRS is a water supply project that may ultimately reuse approximately 120,000 to 140,000 AFY of advanced treated wastewater from the Orange County Sanitation District (OCSD). Currently under construction, the first phase of the GWRS would supply approximately 72,000 AFY of recycled water to supplement existing water supplies. This recycled water would recharge the Orange County Groundwater Basin and protect the groundwater basin from further degradation due to seawater intrusion. The project is under construction and would be completed by May 2007. Approximately half of the water would be injected into the Talbert Seawater Barrier. The other half would be pumped to the OCWD's basin recharge facilities in the City of Anaheim. A small portion of the project has already been completed and is currently producing five MGD of water supply for the seawater barrier.

[14] *The Irvine Desalter Project*, Irvine Water District, Online: http://www.irwd.com/

OCWD's seawater intrusion barrier consists of a series of 28 injection wells running along Ellis Avenue from Euclid Street to Newland Street in Fountain Valley. A mixture of recycled GWRS supply, imported water, and pumped groundwater from deep aquifers totaling about 20 MGD (22,400 acre-feet per year) is pumped to the wells and injected into the ground. This injected water creates an underground dam, blocking seawater from entering the groundwater basin when the basin's supply is drawn below sea level. Most of the injected water migrates inland, adding to the supply of groundwater in other portions of the Basin.

OCWD also provides recycled water for irrigation. The Green Acres Project (GAP), located adjacent to GWRS, produces 7.5 MGD (8,400 acre-feet per year) of recycled water for irrigation of parks, schoolyards, golf courses and greenbelts within five miles of the treatment plant. The GAP stores the treated water in a two-million-gallon reservoir and then distributes it through 25 miles of pipeline to the cities of Costa Mesa, Fountain Valley, and Santa Ana.[15]

The IRWD conducts its own water recycling program. Through the treatment of wastewater, IRWD produces recycled water used to irrigate crops or landscaping. Recycled water now makes up 20 percent of IRWD's total water supply (23,383 acre-feet in fiscal year 2002-2003), reducing the need for imported MWD water and/or groundwater in IRWD's service area. 80 percent of all business and community (parks, school grounds, etc.) landscaping in the IRWD service area is irrigated with reclaimed water.[16]

Retail water purveyors in South Orange County have also pioneered water recycling within the County for many years. The South Coast Water District treats wastewater and uses the recycled water for landscape irrigation on parks, golf courses, playgrounds and greenbelt areas. Currently, the South Coast Water District provides recycled water to about 50 customers, including the Links at Monarch Beach, Niguel Shores, City of Dana Point, City of Laguna Beach, County of Orange, Monarch Beach, Aliso Creek Golf Course and Capistrano Unified School District.[17]

The Santa Margarita Water District operates two water reclamation systems, also located in South Orange County. The Oso Creek Wastewater Reclamation System produces recycled water used for centralized irrigation requirements, which include a golf course, greenbelts, parks and school grounds. The Chiquita Water Reclamation Plant is currently providing recycled water to the communities of Rancho Santa Margarita, Coto de Caza, Talega, Ladera Ranch, and portions of the Trabuco Canyon and Irvine Ranch Water Districts. Upon completion of the second phase, the plant could ultimately reach a capacity of 15 MGD (16,800 acre feet per year). Additionally, the Santa Margarita Water District and the Moulton Niguel Water District own and operate a reclamation facility, which produces a total of 3.2 billion gallons of recycled water a year (9,850 acre feet per year) to neighboring cities.

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15 *Recycling* Brochure, OCWD, Online: http://www.ocwd.com/_assets/_pdfs/recycling.pdf
16 Irvine Ranch Water District. Online: http://www.irwd.com/
17 South County Water District. Online: http://www.scwd.org/about/about.htm#water